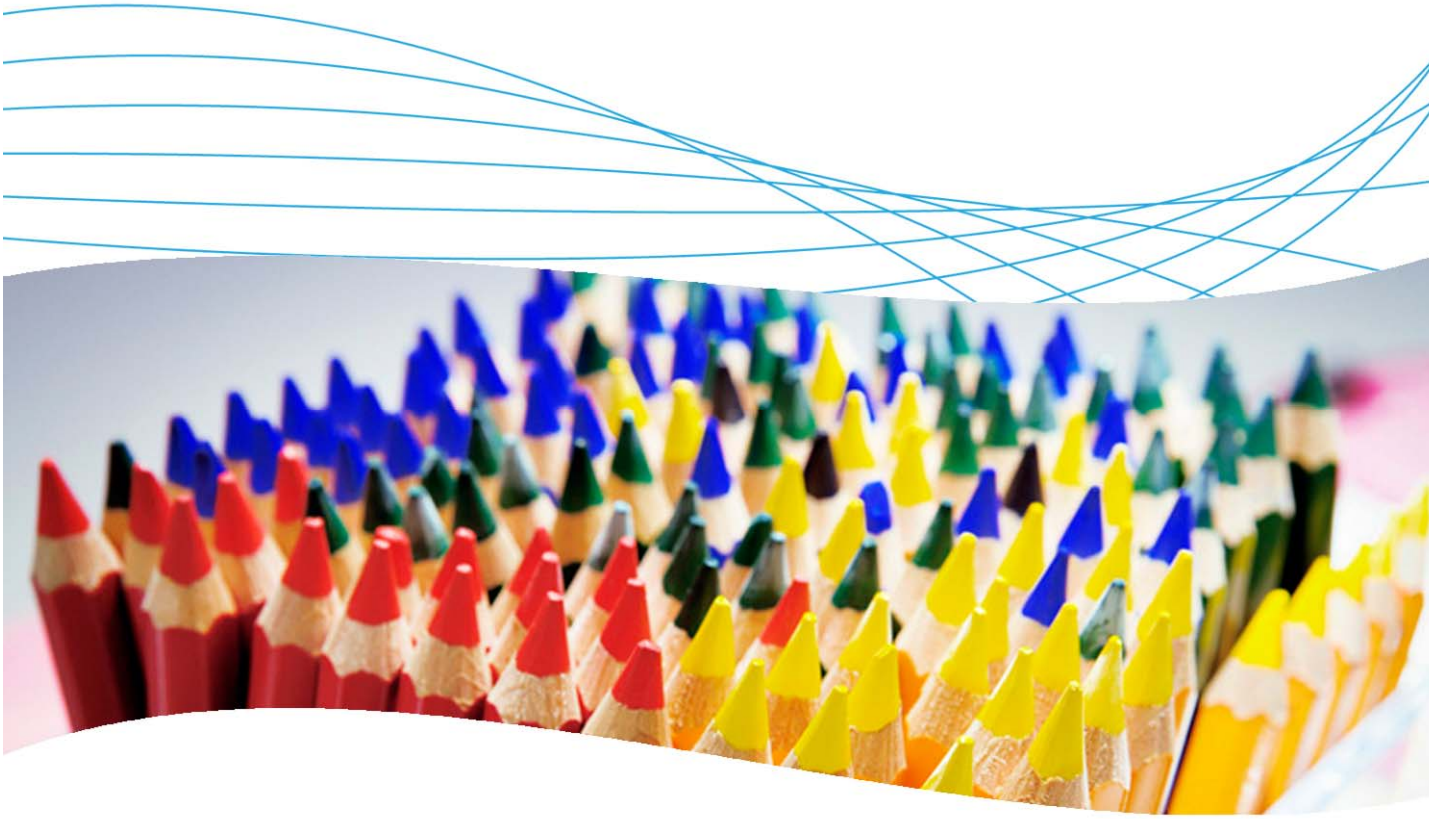
An HP ProCurve Networking Application Note

Interoperability between Mitel IP Phones and ProCurve Switches



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1. Introduction

This document describes how ProCurve switches and Mitel IP phones interoperate to build a secure and easy-to-manage network. Both the switch and the phone rely on standard protocols:

- 802.3af, standard for Power-over-Ethernet (PoE) enables the switch to allocate up to 15.4W of power per port.
- Quality-of-Service (QoS) mechanisms enable the network to give voice flow--which is sensitive to delay, jitter and packet loss--priority over the data traffic, to guarantee that the communications will continue in case of congestion.
- LLDP-MED is a discovery protocol that enables switches to get some layer 2 information about a phone (such as its model, firmware, location, etc.) and automatically allocate certain network parameters (VLAN and QoS) to the phone.
- 802.1X is the most recommended authentication method for access control on the network. It is recognized as a standard, and is implemented by most IP telephony constructors. Multiple 802.1X authentication enables authentication both of a phone plugged into a switch and of a user plugged into the dual port of the phone, while assigning them different profiles (VLAN, QoS, bandwidth).

2. Architecture

The platform contains:

- One or more servers with the following services: Active Directory, DHCP, DNS, Certificate Authority, IAS.
- Latest versions of ProCurve Manager Plus (PCM+) and Identity-Driven Manager (IDM).
- Mitel Networks 5220 IP Phone (Dual Mode).
- A ProVision Switch 3500yl or 2610-PWR with the latest firmware version. A similar configuration can also be used with a ProCurve 5400zl series switch or a 8212zl series switch. The configuration commands are identical for these products and the 3500yl.
- A client laptop that can be plugged into the phone dual port for multiple authentication tests or used as a network analyzer (e.g., Wireshark)

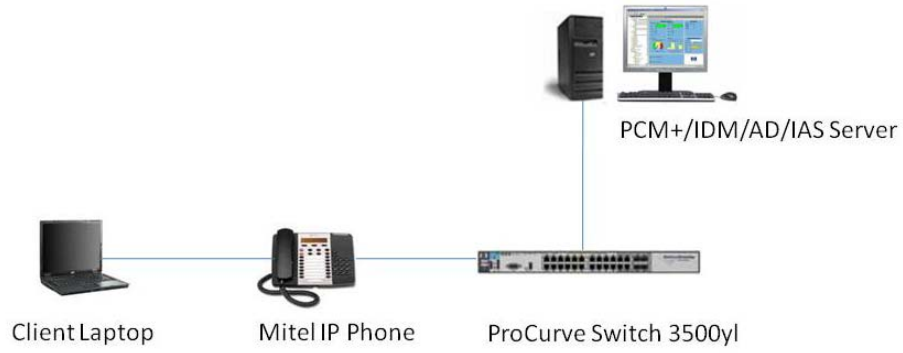

Figure 1. Setup for ProCurve-Mitel interoperability

3. Configuration

This section explains how to configure the Mitel phone and the ProCurve switch.

3.1 Check power over Ethernet compatibility

ProVision switches support standard PoE (802.3af), and so do Mitel phones. When the phone is plugged into a port on the 3500yl switch, it boots up.

To view the power consumption of the phone, issue the following command on the switch:

```
show power-over-ethernet X
```

Where X is the port on which the phone is plugged.

On a 2610 switch, the command is:

```
show power-management X
```

For a Mitel 5220 IP phone this consumption is around 2800 mW:

```
ProCurve Switch 3500yl-48G(eth-9)# sh power-over-ethernet 10

Status and Counters - Port Power Status for port 10

  Power Enable      : Yes
  LLDP Detect       : disabled
  Priority          : low               Configured Type   :
  AllocateBy        : usage             Value             : 17
  Detection  Status : Delivering        Power Class       : 2

  Over Current Cnt  : 0                 MPS Absent Cnt    : 0
  Power Denied Cnt  : 0                 Short Cnt         : 0

  Voltage           : 515 dV            Current           : 55 mA
  Power             : 2830 mW
```

4. Configuring QoS support

This section explains how to configure Quality of Service parameters.

4.1 Configure QoS on the phone

Quality of Service parameters can be configured on the phone using the phone's web interface or using DHCP.

Configuring QoS from the phone's web interface:

1. To access Mitel phone web interface, use a web browser and go to the phone's URL:
   http://<phone-ip-address>
2. By default the login credentials are:
   - Username: **admin**
   - Password: **5220**
3. You can assign values to the 802.1p and/or DSCP fields.

Configuring QoS via DHCP options assignment: Configure the following options on the DHCP server:

- 133 - (specific) Priority (32 bit) 0x6
- 134 - (specific) DSCP value 0 to 63 (32 bit) 0x2e (This hexadecimal value is equivalent to 46 decimal.)

4.2 Configure QoS on the switches

The recommended method is to have a dedicated VLAN for voice and configure the QoS parameters for the VLAN.

The L2 and DSCP policy advertised are based on the actual QoS configuration for the voice VLAN. By default these values are:

- L2 priority 6
- DSCP 46, which corresponds to the Expedited Forwarding (EF) class

To modify the 802.1p or DSCP values:

```
Vlan <vid> qos priority <0-7>   Sets the 802.1p priority for the VLAN
Vlan <vid> qos dscp-map <codepoint> priority <0-7>

No vlan <vid> qos               Removes QoS for the VLAN
```

To view which DSCP and QoS values are configured:

```
Show qos vlan                   Shows DSCP and QoS values
show qos dscp-map
DSCP -> 802.1p priority mappings
DSCP policy    802.1p tag   Policy name
-------------  -----------  ------------------------------
000000         No-override
```

For more information on QoS settings on ProCurve switches, please refer to the following documents:

- For switch 3500yl: http://cdn.procurve.com/training/Manuals/3500-5400-6200-8200-ATG-Jan08-6-Qos.pdf
- For switch 2610-POE: http:/www.hp.com/rnd/support/manuals/2610.htm

5. LLDP-MED support

5.1 Configure LLDP-MED support on Mitel phone

Mitel phones support LLDP-MED since version 7.0 of the 3300 ICP. It is enabled by default.

5.2 Configure LLDP-MED on the switch

1. Defining a VLAN as voice VLAN enables LLDP-MED:

```
(conf)# vlan 70 voice         Enables LLDP-MED
```

2. Then configure LLDP-MED. LLDP-MED must be configured on the switch to support MED TLVs, in particular network policy and capabilities:

```
(conf)# lldp run
(conf)# lldp config <port> medTlvEnable network_policy
(conf)# lldp config <port> medTlvEnable capabilities
```

3. To obtain information about the phone, issue the command:

```
show lldp info remote X
```

Where X is the port on which the phone is plugged.

```
LLDP Remote Device Information Detail

Local Port   : 10
ChassisType  : network-address
ChassisId    : 0.0.0.0
PortType     : mac-...
PortId       : 08 00 0f 15 fb f9
SysName      : MITEL 5220 DM
System Descr : MITEL 5220 DM,h/w rev 0,ASIC rev 0,f/w Boot 02.02.01.03
PortDescr    : LAN port

System Capabilities Supported  : bridge, telephone
System Capabilities Enabled    : bridge, telephone

Remote Management Address
Type    : all802
Address : 08 00 0f 15 fb f9

MED Information Detail
EndpointClass          :Class3
Media Policy Vlan id   :70
Media Policy Priority  :6
Media Policy Dscp      :46
```

5.3 Configure LLDP-MED fine grained power allocation

On a ProVision switch with K.13.XX firmware release you can have the port automatically configure power if the link partner is able to support PoE. When LLDP is enabled, the information about the power usage of the PD is available and the switch can then comply with or ignore this information. You can configure PoE on each port according to the PD (IP phone, wireless device, etc.) specified in the LLDP field. The default configuration is for PoE information to be ignored if detected through LLDP.

Mitel phones support the MED TLV that enables LLDP-MED fine grained power allocation.

To enable LLDP power allocation on the switch, use the command poe-lldp-detect globally or on an interface.

```
ProCurve Switch 3500yl-48G(eth-23)# poe-lldp-detect enabled
```

To view the power consumption of the phone: use the command show power-over-ethernet brief.

Without poe-lldp-detect enabled, by default the power is allocated by usage:

```
(config)# show power-over-ethernet brief

Status and Counters - Port Power Status

PoE   | Power   LLDP     Power     Alloc PoE  Configured  Detection   Power
Port  | Enable  Detect   Priority  By    Val  Type        Status      Class
----- + ------- -------- --------- ----- ---- ----------- ----------- ------
1     | Yes     disabled low       usage 17               Searching   0
2     | Yes     disabled low       usage 17               Searching   0
3     | Yes     disabled low       usage 17               Searching   0
4     | Yes     disabled low       usage 17               Searching   0
5     | Yes     disabled low       usage 17               Searching   0
6     | Yes     disabled low       usage 17               Searching   0
7     | Yes     disabled low       usage 17               Searching   0
8     | Yes     disabled low       usage 17               Searching   0
                 ….
22    | Yes     disabled low       usage 17               Searching   0
23    | Yes     disabled low       usage 17               Delivering  2
24    | Yes     disabled low       usage 17               Delivering  3
25    | Yes     disabled low       usage 17               Searching   0
26    | Yes     disabled low       usage 17               Searching   0
27    | Yes     disabled low       usage 17               Searching   0
```

This output shows that PoE-LLDP detect is enabled on port 23, where the Mitel phone is plugged:

```
ProCurve Switch 3500yl-48G(config)# int 23 poe-lldp-detect enabled

ProCurve Switch 3500yl-48G(config)# show power-over-ethernet brief

Status and Counters - Port Power Status

PoE   | Power   LLDP     Power     Alloc PoE  Configured  Detection   Power
Port  | Enable  Detect   Priority  By    Val  Type        Status      Class
----- + ------- -------- --------- ----- ---- ----------- ----------- ------
1     | Yes     disabled low       usage 17               Searching   0
2     | Yes     disabled low       usage 17               Searching   0
3     | Yes     disabled low       usage 17               Searching   0
4     | Yes     disabled low       usage 17               Searching   0
5     | Yes     disabled low       usage 17               Searching   0
6     | Yes     disabled low       usage 17               Searching   0
7     | Yes     disabled low       usage 17               Searching   0
                                 …
23    | Yes     enabled  high      value 5                Delivering  2
```

This time only 5W is allocated to the phone, by value.

```
ProCurve Switch 3500yl-48G(config)# show power-over-ethernet 23

Status and Counters - Port Power Status for port 23

Power Enable      : Yes
                                LLDP Detect       : enabled
Priority          : high             Configured Type   :
AllocateBy        : value            Value             : 5
Detection  Status : Delivering       Power Class       : 2

Over Current Cnt  : 0                MPS Absent Cnt    : 0
Power Denied Cnt  : 0                Short Cnt         : 0

Voltage           : 516 dV           Current           : 55 mA
Power             : 5000 mW
```

6. Configuring 802.1X support

This section explains how to configure 802.1X support.

6.1 Configure 802.1X login credentials on the phone

To configure the phone:

1. Reset it by removing the LAN cable and simultaneously pressing the Superkey button.
2. Answer the questions as follows:

```
CONFIGURE PHONE?
*=YES       #=NO
NETWORK PARAMETERS? NO
HARDWARE CONFIG? NO
PHONE MODE? NO
TOOLS AND FEATURES? YES
ERASE PIN: NO
EDIT 802.1X SETTINGS? YES
ERASE 802.1X DATA: YES
REBOOT NOW: YES
```

3. Reboot the phone. After reboot you obtain the following message:

```
Port Access Control
Press # to continue
```

4. Press the # key to continue. You are prompted for the username and password.

5. Enter your username and password. Use arrows for lowercase and uppercase.

```
USER (# to end)
PASSWORD  (# to end)
```

6. Once you have been authenticated by the phone, you see this message:

```
LLDP Med discovery running
```

6.2 Configure 802.1 X on the switch

To configure 802.1X on the switch:

1. Enable 802.1X on the phone ports:

```
# aaa port-access authenticator B12          Selects port B12 to act as an authenticator
# aaa port-access authenticator active       Activates the previous command
# aaa authentication port-access eap-radius  Selects the authentication protocol
                                             (eap-radius or chap-radius)
```

2. Enter the RADIUS information in the switch configuration:

```
# radius-server host 10.50.10.170 key procurve      Gives the switch the address and
                                                    key of the radius server
```

6.3 Configure multiple 802.1X sessions

To configure multiple 802.1X sessions:

1. Modify the switch configuration for the port connected to the phone. Configure it so the voice VLAN is tagged and the data VLAN untagged.
2. Set the client-limit parameter on the switch to 3 to enable both the PC and the phone to authenticate. For example:

```
(config-vlan-1)# untagged 7

(config-vlan-12)# tagged 7
(config)# aaa port-access authenticator 7 client-limit 3
```

The data VLAN can also be dynamically assigned using Identity Driven Manager.

7. Upgrading the Mitel phone firmware version

Firmware versions of the switches used for this application note are as follows:

- K.13.09 for the ProCurve ProVision switches (5406zl, 3500yl, 8212zl)
- R.11.07 for the ProCurve Switch 2610-PWR

Firmware version of the Mitel phone 5220 is SIP 6.0.0.19. Release 6 is recommended because this release ensures the Mitel phone can support 802.1X and LLDP-MED capabilities. To follow the procedures in this application note, you will need to upgrade your Mitel phone to this version.

7.1 Download firmware and upgrade the Mitel phone

To upgrade the Mitel phone's firmware, you need to copy and extract firmware files to a TFTP server. Note that Mitel firmware is available from: http://sipdnld.mitel.com/

To upgrade the Mitel phone's firmware:

1. On the Mitel phone, confirm your firmware version by holding down the volume up key to get into configuration mode, then navigate to "View Version Info". Look for the "main load version". (This procedure assumes your firmware is at release 3.x. If you are running release 4.x, start with the latest release 5 build on the TFTP server instead of the release 4 build.)
2. Set up a TFTP server. If one is not readily available there are many available as shareware or freeware on the Internet. Make sure that you write down the IP address of where you have the TFTP server running.
3. Unzip the latest release 4 firmware build into the TFTP root of your TFTP server.
4. Power the phone while holding down the * and 7 key to switch to SIP mode. Hold down the keys until you see the change confirmed on the phone display.
5. Assuming that the phones are using DHCP, power the phone while pressing the volume up arrow. You are now in the phone's configuration mode.
6. Navigate through the menus until you see a place to change the TFTP server address (Network parameters, modify static settings). Enter the IP address of your TFTP server from step 2 above.
7. While the phone is booting you will see an option to upgrade via TFTP. Select yes. (You may have to press * for yes depending on the phone). You should then see the firmware upgrading. When this is complete, you see the date and time appear on the phone.
8. Once the firmware upgrade is complete, delete build 4 from the TFTP root.
9. Then unzip the latest release 5 build into the TFTP root, and repeat steps 5, 6, 7, and 8. Steps 5 and 6 are very important, because the network setting returns to the factory default after an update.
10. Once the release 5 firmware upgrade is complete, repeat the steps again for release 6.

7.2 Upgrading through the Mitel 3300 ICP

Another possibility for upgrading is through the Mitel 3300 ICP IPBX, which must have at least release 7.0 (latest is 8.0 UR3) to ensure LLDP-MED and 802.1X support.

8. Reference documents

For further information about how to configure ProCurve switches to support convergence, please refer to the following links:

- For user manuals for ProCurve 3500yl-5400zl-8212zl switches:
  http://www.hp.com/rnd/support/manuals/3500-6200-5400-ChapterFiles.htm

- For ProCurve Switch 2610 series manuals:
  http://www.hp.com/rnd/support/manuals/2610.htm

- For PCM+ and IDM manuals:
  http://www.hp.com/rnd/support/manuals/ProCurve-Manager.htm
  http://www.hp.com/rnd/support/manuals/IDM.htm

- For information on Mitel phones please refer to the following site:
  http://edocs.mitel.com/default.htm

For further information, please visit www.procurve.eu

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